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SCIENCE RESOURCES STUDIES HIGHLIGHTS

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ORIGINAL

Employment of Recent Science and Engineering (S/E) Graduates in S/E Fields Increased

This report presents major findings of the 1980 New Entrants Survey, which was conducted to assess the early experience of 1978 and 1979 recipients of bachelor's and master's degrees in S/E fields. The report also uses the results of earlier sample surveys of recent S/E graduates conducted in 1976, 1978, and 1979 and a rapid-response survey of industrial employers carried out in 1981. A stratified sampling procedure was used, including one stage for institutions and a second stage for graduates. The 1980 sample included 192 participating institutions and 27,750 graduates. The overall response rates for bachelor's- and for master's-degree recipients were 58.3 percent and 50.3 percent, respectively. Surveys in this series provide one of the major data bases used by the National Science Foundation (NSF) to estimate the characteristics and activities of the S/E population in the United States.

Highlights

- The 1978 and 1979 S/E graduates achieved higher employment rates in 1980 than those reported by their 1974 and 1975 counterparts for 1976. Of the new bachelor's-degree entrants in the 1980 labor force, 96 percent were employed, inside or outside of S/E fields, compared to 91 percent four years earlier. At the master's-degree level, the comparable figures were 98 percent versus 95 percent.
- The S/E utilization rate, i.e., the proportion of new S/E graduates in the labor force employed in S/E jobs, was also higher in 1980 than in 1976. The rate for bachelor's-degree recipients increased by one-fourth, from 41 percent to 51 percent, and the rate for master's-degree recipients increased from 74 percent to 80 percent. More than 9 out of 10 of the bachelor's recipients in engineering were working in S/E jobs in 1980, contrasted to fewer than 1 in 5 of those in social sciences.
- Although social science degree recipients experienced very low S/E utilization rates, they still achieved a high overall employment rate. The employment rate for social science baccalaureates in all fields—both S/E and non-S/E—was 96 percent in 1980, up from 89 percent in 1976. Of those employed full time in non-S/E fields, over one-half stated that their reason for taking a non-S/E position was personal preference; fewer than one-fourth stated that an S/E position was not available.
- Women with S/E bachelor's degrees achieved essentially the same employment rate as men, 96 percent versus 97 percent in 1980. The comparable rates in 1976 were 89 percent for women and 93 percent for men. Women also increased their S/E utilization rate from 26 percent to 37 percent over this 4-year period. Women have much lower S/E utilization rates than men, in part because there is a high concentration of women in social sciences where rates are below average, and they have lower participation in engineering, where rates are above average.
- The demand for new graduates in computer science continued to be strong in 1980. There was an approximate supply/demand balance in engineering and chemistry. The average balance in engineering, however, may have masked shortages in some engineering specialties. There was excess supply in other fields, particularly in social sciences and mathematics. The imbalance of supply over demand was much smaller for master's degree-holders in the physical, life, and social sciences. Findings from a more recent NSF rapid-response survey of a sample of industrial employers indicates that this general pattern of employment conditions for new S/E graduates continued through late 1981. Shortages were noted in several engineering fields, and surpluses in chemistry, physics, and civil engineering.

Introduction

Information on the transition of S/E graduates from undergraduate status to either graduate school or to the market place provides sensitive indicators of current labor market conditions (i.e., demand and supply). The level of success experienced by those who seek employment (i.e., enter the labor market) provides an early indicator of shifts in the demand situation. The number entering the labor force constitutes additions to current supply. In addition, the reported graduate school status of recent graduates provides an early indication of future additions to the supply of scientists and engineers with advanced degrees. Moreover, the employment experiences of recent graduates affect decisions of current and potential college students in their choices of study and possible careers.

In the discussion that follows, new graduates are considered to fall into one of three categories: (1) those in the labor force; (2) those attending graduate school as full-time students, or (3) those outside the labor force (exclusive of full-time students). Within the labor force, new entrants may be either employed, or unemployed and seeking employment. If employed, they

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Prepared in the Supply and Education Analysis Group, Division of Science Resources Studies.

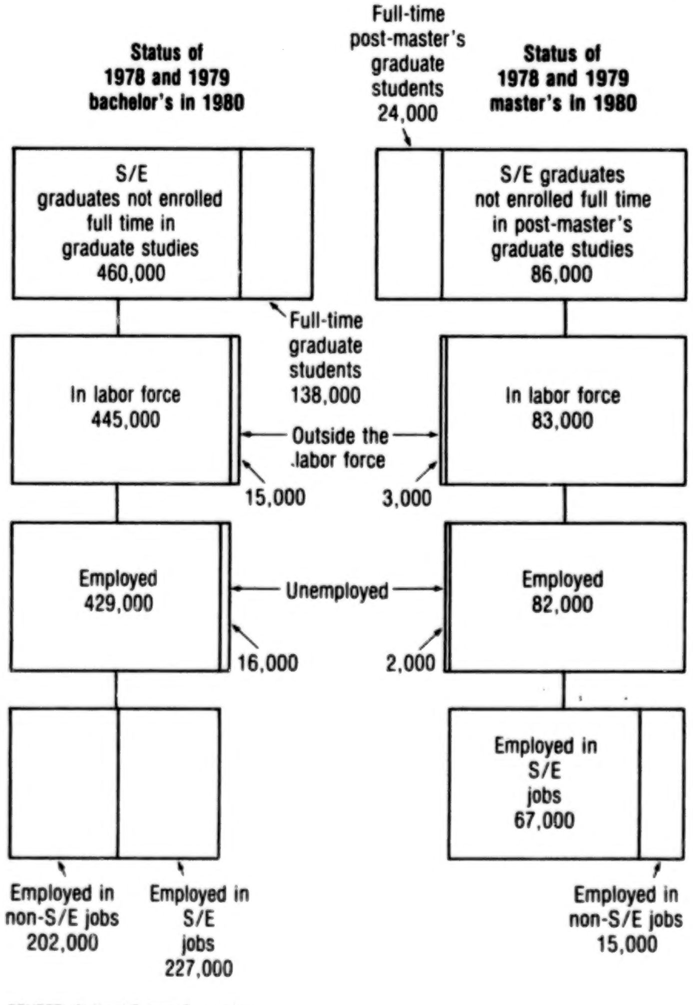
may be full- or part-time employees and may or may not be in an S/E field. The surveys conducted in 1976 and 1980 provide an excellent basis of comparison because each collected comparable information from recipients of bachelor's and master's degrees in the two immediately preceding years.

Although not all S/E students intend to pursue S/E careers, the 1980 survey shows that the combined 1978 and 1979 graduates had a more successful transition from school to work than did the 1974 and 1975 cohorts in 1976 at both degree levels. In part, the differences observed are cyclical, since 1976 was a year in which the economy began recovery from the most serious recession since 1957-58. In contrast, 1980 was the year in which the economy reached the peak of its expansion. Thus, a significant part of the observed differences in labor-market experience of these cohorts reflects short-term cyclical changes (as opposed to the remainder of the difference, most of which is the result of more fundamental long-term influences). A consequence of this is that caution should be applied about how the changes discussed in this study should be interpreted. They do not fully represent fundamental changes in the labor-market structure or conditions for recent S/E graduates.

BACHELOR'S-DEGREE RECIPIENTS

Almost one-fourth of the S/E bachelor's-degree recipients were full-time graduate students at the time of both surveys (chart 1). The labor-force entry rate of the 1978 and 1979 graduates was only slightly greater than that of the 1974 and 1975 cohorts (74 percent compared to 72 percent). The rate of employment of those in the labor force was also higher in 1980 than in 1976 (96 percent versus 91 percent). Furthermore, the 1980 survey found that one-half of the labor-force participants were employed in S/E jobs compared to only two-fifths in the 1976 survey. The percentage unemployed, but seeking employment, fell dramatically from 8.5 in 1976 to 3.6 in 1980.

Chart 1. Transition of science/engineering (S/E) bachelor's- and master's-degree recipients from school to work


Status of 1978 and 1979 bachelor's in 1980
Full-time post-master's graduate students 24,000
Status of 1978 and 1979 master's in 1980
S/E graduates not enrolled full time in graduate studies 460,000
S/E graduates not enrolled full time in post-master's graduate studies 86,000
Full-time graduate students 138,000
In labor force 445,000
In labor force 83,000
Outside the labor force
15,000
3,000
Employed 429,000
Unemployed
Employed 82,000
16,000
2,000
Employed in S/E jobs 67,000
Employed in non-S/E jobs 202,000
Employed in S/E jobs 227,000
Employed in non-S/E jobs 15,000

SOURCE: National Science Foundation

MASTER'S-DEGREE RECIPIENTS

Improvements similar but less dramatic than those for bachelor's-degree recipients were experienced by the 1978 and 1979 cohorts at the master's level compared to the 1974 and 1975 classes (chart 1). There was a small increase in the proportion continuing in graduate school (22 percent versus 19 percent) and a corresponding decrease in the proportion entering the labor force (78 percent compared to 76 percent). The 1978 and 1979 cohorts who were in the labor force were more successful, however, in terms of finding employment (98 percent versus 95.5 percent), finding S/E jobs (80 percent versus 74 percent), and finding full-time S/E jobs (75 percent versus 69 percent). Unemployment rates fell from 4.5 percent to 2.2 percent. In each of the two surveys, the master's-degree recipients reported higher employment rates, particularly for employment in S/E jobs, and lower unemployment rates than those with bachelor's degrees.

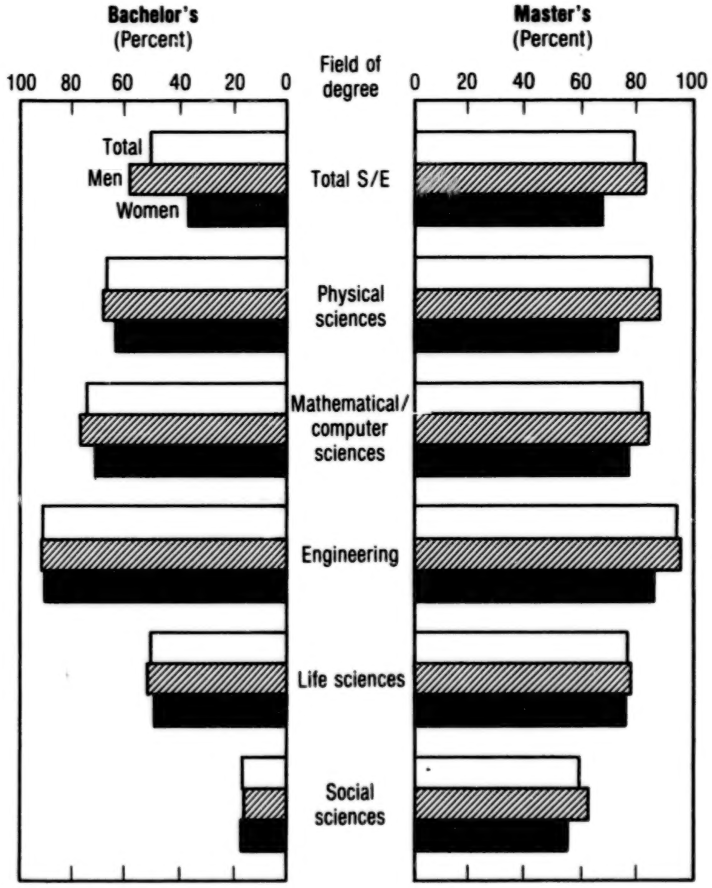
Employment in S/E Jobs

Relative demand for new entrants can be measured by the percentage in the labor force who are employed. Another, and perhaps more useful analytical measure is the "S/E utilization rate" which is the percent of recent S/E graduates in the labor force who are employed in S/E jobs, though not necessarily in the same field as their degree. The 1980 S/E utilization rate increased over that of 1976 at both degree levels—from 74 percent to 80 percent at the master's-degree level and from 41 percent to 51 percent at the bachelor's level. There were substantial variations in the S/E utilization rate by field of degree and by sex (chart 2). For example, more than 9 out of 10 of the bachelor's recipients in engineering were working in S/E jobs, but less than 1 in 5 in social sciences were so employed. There are also wide variations within some major field groups. In 1980, for example, bachelor's degree-holders in computer sciences had an S/E utilization rate of 92 percent versus 60 percent for mathematicians. At the master's-degree levels the rates were 93 percent and 71 percent, respectively. The S/E utilization rates were higher for master's-degree recipients in each major field category.

Men reported higher utilization rates than women in most fields, but rates for both sexes were nearly equal in life sciences at both degree levels, and in engineering and social sciences at the bachelor's level. The higher utilization rates for men in all S/E fields combined are largely the result of the distribution of men and women among fields, and this is particularly true at the baccalaureate level. Men predominate in engineering where rates are above average, and a high percentage of women are in social sciences where rates are below average.

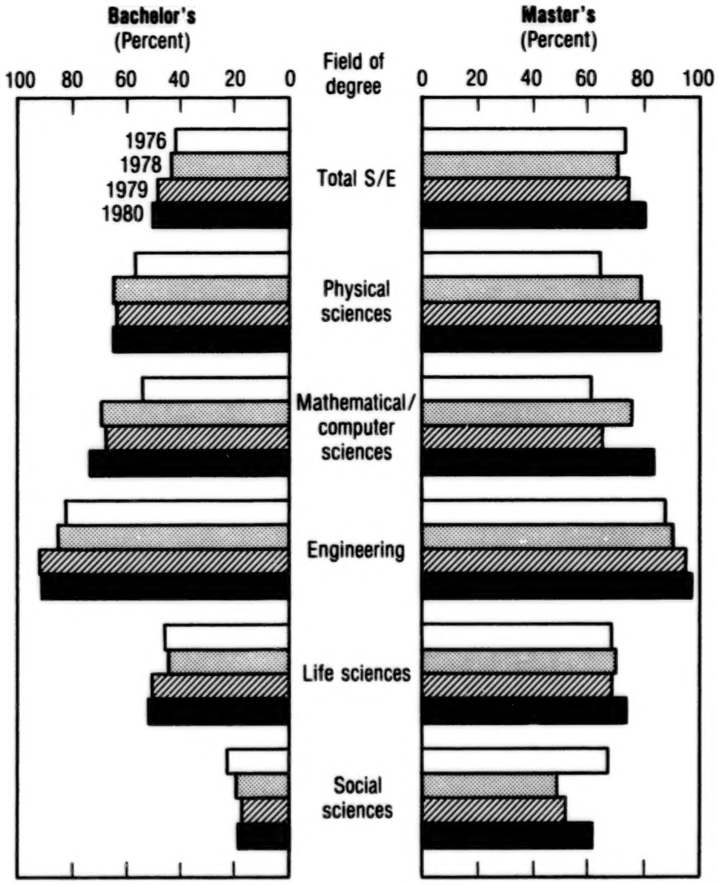
S/E utilization rates of recent degree recipients two years after graduation increased in most field categories between 1976 and 1980 (chart 3). The most notable increases occurred in physical sciences and in mathematical/computer sciences at both degree levels.

Chart 2. Science/engineering (S/E) utilization rates of 1978 and 1979 S/E bachelor's- and master's-degree recipients[a] by field of degree and sex: 1980



[a]Excludes individuals enrolled full time in graduate school.
SOURCE: National Science Foundation

Chart 3. Science/engineering (S/E) utilization rates of recent S/E bachelor's- and master's-degree recipients:[a] 2 years following graduation



[a]Excludes individuals enrolled full time in graduate school.
SOURCE: National Science Foundation

Employment in Field of Degree

Many students are interested in the opportunities for employment within their chosen field of study. Such prospects improved between 1976 and 1980. The rates for employed S/E baccalaureate recipients working within their degree field increased from 36 percent to 44 percent, and for master's-degree recipients, increased from 67 percent to 73 percent.

As may be expected, the "employed in field" rates are lower than the S/E utilization rates, but follow similar patterns in variations by degree level, field, and sex. (See chart 4 on page 4). As for the S/E utilization rate, there is a substantially larger "employed in field" rate for graduates with master's degrees than for those with only bachelor's degrees. Only one-half of the male bachelor's-degree recipients were employed in field, but the rate for master's-degree recipients was three out of four. This differential between master's- and bachelor-s degree recipients among women was even more than that among men. The life and social sciences exhibited the largest differential in the rates for the master's degree-holders over bachelor's degree-holders.

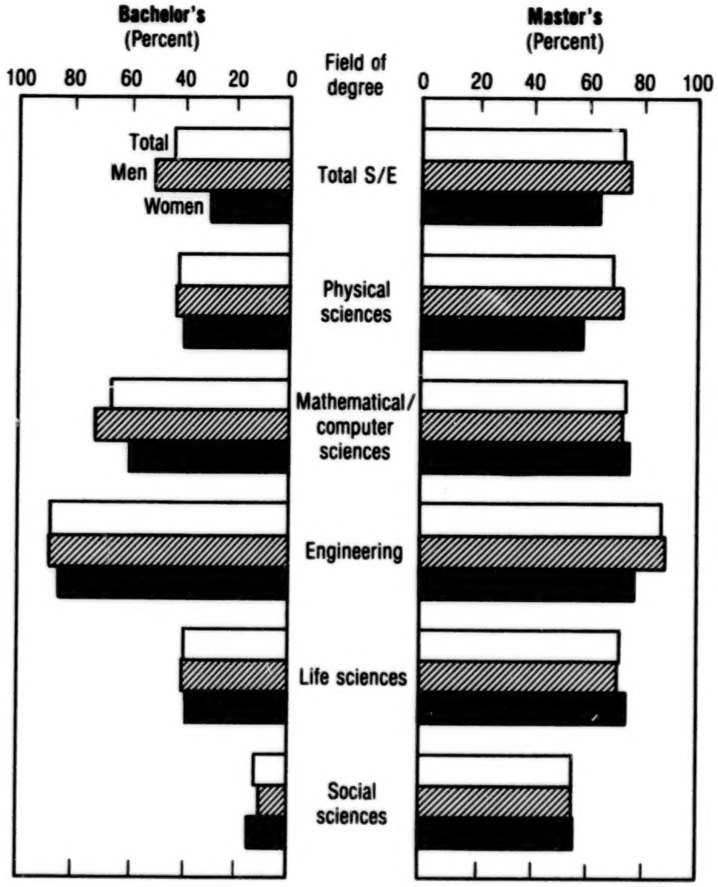
Adequacy of Recent S/E Degree Production

Many recent S/E graduates are employed in non-S/E occupations and some are employed in S/E fields other than that of their degree. It is, therefore, useful to examine the adequacy of recent S/E degree production in terms of "demand" as approximated by actual employment. One measure of adequacy is reflected by the ratio of new entrants in the labor force (classified by field of degree) to new entrants employed (classified by S/E employment field). A ratio greater than 1.0 indicates a relative excess supply of recent graduates in that field; a ratio of less than 1.0 indicates a relative excess demand. The most current measure available of "supply and demand" is in the 1980 employment experience of 1979 graduates. The data show that new entrants (supply) exceeds employment of new entrants (demand) in most fields at both the bachelor's- and the master's-degree level (1.9 and 1.3 to 1, respectively), although the overall imbalance was smaller at the master's level.

Sector of Employment

Two-thirds of the 1978 and 1979 S/E graduates in S/E jobs were employed in business and industry—70 percent of those with bachelor's degrees and 55 percent of those with master's degrees. Educational institutions employed only 7 percent of those with bachelor's degrees and 16 percent of those with master's degrees. Business and industry was the predominant employer for physical scientists, mathematical/computer scientists, and engineers at both degree levels. Life scientists and social scientists were more evenly distributed among the employment sectors. A comparison of 1977 and

Chart 4. Percent of employed 1978 and 1979 science/engineering (S/E) bachelor's- and master's-degree recipients[a] working in field of degree by sex: 1980



[a]Excludes individuals enrolled full time in graduate school.
SOURCE: National Science Foundation

1978 S/E-degree recipients every other year after graduation, shows little change in sectoral distributions. There were slight increases in the proportion of 1978 recipients in business and industry for both degree levels. The offsetting declines were in government for the bachelor's-degree recipients and in the "other" sector for master's-degree recipients.

Employment by Race

Among the 1978 and 1979 bachelor recipients who entered the labor force the distribution by race was 93 percent, white; 4 percent, black; 2 percent, other minority; and 1 percent, unknown. The employment rates were as follows:

	Total employment rate	*S/E utilization rate*	*In-field employment rate*
All new entrants	96%	51%	44%
White	97	51	44
Minority	92	45	42
Black	91	39	37
Other minorities ..	95	58	54
Race unknown	94	48	45

Except for life sciences, the S/E utilization rate of blacks with degrees in a given field was below the average for all degree recipients in that field.

At the master's-degree level, nonblack minorities accounted for the largest share of minority group members who entered the labor force—the reverse of the situation at the bachelor's-degree level. The distribution of the new master's-degree entrants were whites, 91 percent; blacks, 2 percent; nonblack minorities, 6 percent; and race unknown, 1 percent. The total employment rates of these new entrants were whites, 98 percent; blacks, 87 percent; and nonblack minorities, 99 percent.

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